CFS Policy Paper

Systemic Risk and the Tri-Party Repo Clearing Banks

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Executive Summary

The recent crisis in financial markets has focused attention on systemic risk, that is, on how the failure of one financial institution can wreak havoc on the financial system as a whole. But one significant source of systemic risk has not received much general attention because it lies in the relatively obscure tri-party repo system, through which broker-dealers fund a sizeable portion of their assets. In short, the poor design of the tri-party repo system has the potential to wreck the financial health of a large clearing bank or to contribute to the demise of yet another broker-dealer. While regulators and industry specialists are aware of this danger, their proposed solutions to date are not ideal, ranging from the Fed's overseeing voluntary industry improvements to an explicit government role in the system and the establishment of a too-big-to-fail back-up entity.

This paper first explains how the design of the tri-party repo system, while solving various operational problems in the secured funding markets, actually creates significant systemic risk. More precisely, by giving broker-dealers use of their security collateral during the day the system effectively transfers the intra-day risk of a broker-dealer default from many secured lenders to the two clearing banks. This paper then argues that imposing capital requirements and risk charges on this intra-day risk will force the industry to correct the existing systemic risk on its own. Furthermore, as an added benefit, these requirements and charges will, by leveling the playing field in the provision of services to the secured funding market, spur competition and innovation. Finally, this paper argues that the alternate policy proposals mentioned above will not be as effective in stabilizing and strengthening the secured funding market.

1. A Brief Introduction to U.S. Repo Markets

A repurchase agreement, or repo, is essentially a secured loan.[1] One party borrows cash from another and posts securities as collateral. When the agreement expires, the borrower pays back the loan principal with interest and the lender returns the collateral. Agreements are typically "overnight," expiring after a day, but "term" agreements are struck for several months or longer. Collateral is typically U.S. Treasuries, Agencies, and agency MBS, but corporate bonds, municipal bonds, other asset-backed securities, and equities are posted as well.

The repo market plays several important roles in financial markets:

- While broker-dealers want to hold securities, both to facilitate their market-making activities and as investments, they do not want to commit scarce capital by purchasing these securities outright. The repo market allows them to use borrowed money to pay for the purchases by posting the securities they buy as collateral. (When the repo expires, the borrower of cash must either sell the security to pay back the loan or, quite commonly, "roll" or renew the repo for another day or term.) Repo trades for this purpose are also called "funding trades."
- Leveraged investors, like many hedge funds, buy securities and finance the purchases through the repo market as well.
- Non-leveraged investors, including state and local governments, money market funds, other mutual funds, and foreign sovereign entities, prefer the relative safety of lending money on a secured basis to bearing the direct credit risk inherent in other money market investments.
- The repo market provides the mechanism by which securities are borrowed so that they may be sold short: the short-seller lends money in the repo market, takes the security he wishes to short as collateral, and then sells the security. (When the repo expires the short-seller must either buy the security in the market to return the repo collateral or roll the repo.) By facilitating short sales the repo market not only promotes price efficiency but provides opportunities for holders of securities, e.g., insurance companies and pension funds, to earn incremental returns by lending out their securities as repo collateral.
- The Federal Reserve uses repo to add or remove liquidity from the financial system, particularly when such actions are expected to be unwound in relatively short order.[2]

While extremely safe relative to other financial transactions, borrowing and investing cash in the repo market is not risk free. Should the borrower of cash default on a loan, the lender of cash can sell the collateral and use the proceeds to cover the loan. The risk of a repo to the lender of money, therefore, is that the counterparty defaults on the loan at the same time that the value of the collateral has fallen. Conversely, should the lender of cash default by not returning collateral, the borrower of cash need not repay the debt. Hence the risk of a repo to the borrower of money is that the counterparty defaults at the same time that the value of the collateral has risen. To mitigate these risks, the weaker of the two counterparties typically posts margin. For example, the borrower of cash might post $100mm of collateral to borrow $80mm of cash or the lender of cash might lend $110mm of cash to take $100mm of collateral.

The repo market is a significant source of funding for security brokers and dealers and, as a result, has been at the center of recent market convulsions. From 2003 to 2007 net repo borrowings by broker-dealers increased from $490.4 billion to $1.1 trillion, accounting for between 30% and 40% of their total liabilities over that time period and for 37.9% at the end of 2007. Subsequently, as a result of deleveraging in 2008-2009, net repo borrowings fell to $480.0 billion by the end of the second quarter of 2009, accounting for only 25% of total liabilities.[3]

2. The Operational Reality of Tri-Party Repo, in Particular the Daily Unwind, Exacerbates Systemic Risk

2.1 Ideally, the clearing banks would be pure agents, and not principals, in funding trades.

Secured funding markets should satisfy three[4] essential objectives:

a) Independent custody: an independent custody agent holds the collateral against loans so that this collateral is truly available to the lender of cash in the event of a default by the borrower;
b) Pricing and margin collection: an independent agent prices the collateral so that the agreed amount of collateral, including margin, is held against the loans;
c) Settlement: securities and cash move to and from the accounts of borrowers and lenders as and when appropriate.

In pursuit of these objectives, the market has settled on tri-party agents, or clearing banks. There are two such clearing banks for the U.S. repo market: JPMorgan Chase and Bank of New York Mellon.

Ideally, tri-party agents would be truly and exclusively agents of repo transactions, as opposed to principals. In that case, daily operations of the market would work as follows. At the initiation of a trade, the borrower of cash would deposit securities into its account at the clearing bank and the lender of cash would deposit cash into its account. The clearing bank would first check that the securities have the agreed upon value and then simultaneously i) move the cash into the borrower's account (which the borrower would presumably withdraw for use in paying for the securities), and ii) move the securities into the lender's account. Then, at the expiration of the repo contract, after the borrower deposits enough cash to repay the loan with interest, the clearing bank would simultaneously pass the cash to the lender and return the securities to the borrower.

In fact, to the surprise of many even seasoned professionals, the operational reality of the market deviates from the ideal, that is, the clearing banks are not acting truly and exclusively as agents of funding transactions.

2.2 Because of current system limitations, operational reality deviates from the ideal and the clearing banks become intra-day secured lenders to the broker-dealers.

Consider the sample set of trades in Figure 1. (For simplicity the figure ignores margin and interest.) During the previous day the broker-dealer (B/D) had borrowed $100 from funder #1 and posted security A as collateral. Today it needs to return that $100 and retrieve security A. In addition,

the B/D sells A to one customer, buys B from another customer, sells B to another, and finally buys C from yet another. These transactions leave the B/D with security C but without cash to pay customer #4. Hence, the B/D borrows $100 from funder #2 through the repo market, posting C as collateral.

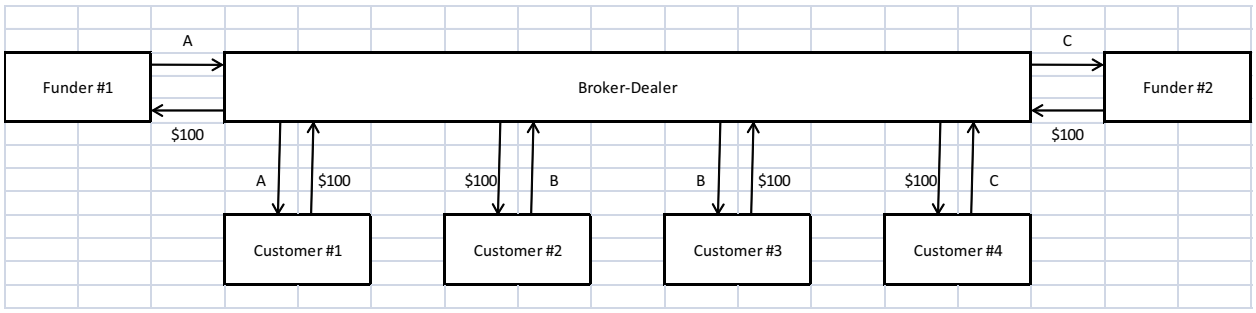

Figure 1

In an ideal system, where the tri-party agents are truly agents, the clearing bank does not release security A to the B/D until the B/D repays the $100 borrowed from funder #1. But then how can the trades in the figure actually get done? More precisely, customer #1 will not send $100 until the B/D has A to deliver, but the B/D cannot retrieve A without that $100! Similarly, customer #2 will not deliver B without the B/D having $100, etc.

Theoretically these trades could all get done by waiting until the end of the day and settling them all simultaneously. But to date this has been deemed impractical: given the vast number of trades and the time it takes to clean up errors, in addition to some constraints of working in a single time zone, current systems could not start the settlement process at the end of the business day and finish by the start of the next business day. Another theoretical possibility would be a system clever enough to settle sets of self-contained trades (like the two trades involving security A in the example) as they cleared during the day. But no such system exists today.

Yet another way to complete the trades in the example is for the clearing bank to "grease" the system by extending intra-day credit. Specifically, say the clearing bank gave $100 **of its own** to funder #1 and then moved security A to the B/D's clearing bank account **without collecting $100**. At this point the clearing bank is the secured lender: it has extended a $100 loan and has access to A, held in the B/D's clearing bank account, as collateral. Next, the B/D directs the delivery of A to customer #1 in exchange for $100 and then directs that $100 to customer #2 in exchange for B. Pausing again at this point, the clearing bank is the secured lender of $100 with B in the B/D's clearing bank account as collateral. Continuing in this way the sample customer trades can all be settled in sequence. Finally, at the end of the day, the clearing bank moves C to funder #2's account while keeping the $100 loan for itself as the return of its intra-day credit of $100 that started the cycle. Thus, at the end of the day and "overnight," funder #2 is the secured lender and the clearing bank is just an agent. This example describes essentially what happens in the market today through a process called the "daily unwind."

2.3 While the daily unwind does facilitate operations given system limitations, its transfer of intra-day default risk from secured lenders to the clearing banks introduces, as a direct consequence, significant systemic risk.

In every morning's "unwind," without any cash coming from the borrowers, the clearing banks make cash available to the lenders and return securities to the borrowers' clearing bank accounts. As illustrated in the example, this has the great operational advantage of facilitating the borrowers' trading of these securities during the day. And, by the evening, since the borrowers have usually arranged to roll the repo with the same or another lender, the clearing banks are able to recover their cash by taking cash from the lenders' accounts in exchange for securities taken from borrowers' accounts. However, as also illustrated in the example, this process implies that during the day the clearing banks are effectively the secured lenders of the repo transactions. Hence, a very significant, unintended consequence of an operational solution to settlement problems is that an enormous amount of intra-day risk is shifted from secured lenders to the clearing banks.

The daily unwind currently applies to term transactions as well. One might think that in a term transaction a B/D never needs its securities in the morning because the lender is committed to its loan until the expiration of the repo. However, most term repo transactions grant substitution rights allowing the borrower to replace existing collateral with other collateral that is equally acceptable to the lender. Hence, the daily unwind serves a useful operational purpose for term repo as well. However, allowing a term lender to withdraw its cash each and every day, so that clearing banks bear intra-day risk every day even on term repos, is a staggering unintended consequence of the solution to an operational problem.

By shifting intra-day risk from secured lenders to the clearing banks, the daily unwind exacerbates systemic risk in three ways:

1. **The clearing banks are at great risk.** The daily unwind leaves the clearing banks holding all the intra-day risk arising from the secured financing of broker-dealers. This seems reckless given that these two banks are themselves large and systemically important financial institutions. Furthermore, these substantial intra-day risks are not included in the calculation of risk-adjusted assets and, therefore, are not even on the radar of the regulatory structure governing bank capital requirements or risk charges.
2. **A broker-dealers' ability to do business can be terminated by a clearing bank.** The daily unwind makes broker-dealers extremely vulnerable to the decisions and financial health of the two clearing banks. If clearing banks were simply tri-party agents, the ability of a broker-dealer to finance itself through repo markets would depend entirely on the secured lenders who would constantly be evaluating whether or not to roll or initiate new repo trades. But because of the current operational realities of the repo market, a clearing bank can put a particular broker-dealer out of business by refusing to effect its daily unwind, i.e., by refusing that broker-dealer timely access to its securities.
3. **Secured lenders have weaker incentives to monitor risk than they should.** The current system blunts the incentives of the secured lenders to monitor their counterparty risks, particularly from term repo. Since lenders know about the daily unwind they know that their cash is

available if they get nervous about a counterparty during the day. This can be a particularly significant advantage for term trades.[5]

It is worth noting that, in response to the perceived risk that overnight secured lenders would all at once refuse to roll loans to a broker-dealer, various regulatory initiatives are seeking to encourage term in preference to overnight financing. But since the daily unwind substantially weakens the stabilizing influence of term financing on the risk profile of a financial institution, these regulatory initiatives will prove less effective in practice than in theory.

3. Systemic Risks of Tri-Party Repo during the Collapse of Bear Stearns and Lehman Brothers

It is difficult to discern from publicly available information how the daily unwind contributed to systemic risk during 2008. However, it is likely that 1) the transfer of intra-day counterparty risk described in the previous section left the clearing banks directly and significantly exposed to defaults by Bear Stearns and Lehman Brothers; and 2) the possibility that the clearing banks might realize losses from this exposure was enough to precipitate some of the actions taken by them and by the Fed.

While most commentary throughout 2008 focused on the "run" of secured funders and prime brokerage balances away from Bear Stearns and on the extensive and leveraged holdings of impaired assets at Lehman Brothers, there are indications that actual or potential exposures faced by the clearing banks were relevant to the course of events. Chairman Bernanke explained the initiation of the Term Securities Lending Facility (TSLF)[6] and the Primary Dealer Credit Facility (PDCF)[7] during the week Bear Stearns collapsed by stressing the systemic danger of secured lenders abandoning the repo markets. But, amidst those remarks, he added the following:

For some time we have been working with market participants to develop a contingency plan should there ever occur a loss of confidence in either of the two clearing banks that facilitate the settlement of tri-party repos… [A] stronger financial system may require changes … in the settlement infrastructure operated by the clearing banks.[8]

And, in describing the Fed's decision the day before the Lehman bankruptcy to expand the collateral accepted against PDCF loans, a Federal Reserve Bank of New York paper[9] reported that

Although the potential failure of a major repo market participant was the immediate impetus for the Fed's decision to expand the collateral eligible for pledge in the PDCF, the Fed was also responding to more general concerns about the structure of the triparty repo system—specifically, the exposure incurred by the clearing banks to a possible default by borrowers in the market.

Finally, a remarkable work of journalism[10] reported that the week before Lehman Brothers went bankrupt JPMorgan Chase was advancing Lehman Brothers more than $100 billion a day and that the following week the amount was, on average, $69 billion a day. The article also reports that Barclays Capital deal makers "suspected that the collateral that Lehman Brothers had pledged to JPMorgan was not as good [as the collateral posted to the Fed]" and then mentions a specific instance of particularly

impaired collateral that had been posted to JPMorgan Chase. Now while there does not seem to be any publicly available estimate of the value of the collateral posted against that $69 billion, the potential for loss was significant. To put the numbers in perspective, at the end of the third quarter of 2008 JPMorgan Chase had $112 billion of Tier One capital or 8.9% of assets. This means that a loss of 10% on the $69 billion would have wiped out 6.2% of Tier One capital.

4. Policy Recommendations

4.1 The dangers of the tri-party repo system were perpetuated because the intra-day risk of the daily unwind was never penalized.

The previous sections argue both from first principles and from the events of 2008 that the daily unwind conducted by the clearing banks is an unacceptable source of systemic risk. To decide on policies to eliminate this source of systemic risk it is useful to ask how the market settled on such a dangerous solution to its operational problems in the first place. One important contributor has to have been that the capital requirements and risk charges governing the clearing banks do not incorporate the intra-day risk of the daily unwind. Put another way, there was little incentive to create a safer system when the dangers of the evolving system were never penalized. Furthermore, given that the clearing banks could run their systems without committing an appropriate amount of risk capital, it would have been extremely difficult for a competing system, like a clearing house, to emerge: any such competitor would almost certainly have to raise capital commensurate with its intra-day exposures or would have to expend significant technological costs to create a system that could satisfy settlement requirements without incurring the intra-day exposures.

4.2 Imposing capital requirements and risk charges on intra-day risk would force the industry to address the systemic risk of the system and would level the playing field in the provision of services to the secured funding market.

In light of the root cause of the systemic risk, the policy solution seems quite straightforward: incorporate the intra-day risks of the daily unwind into the regulatory framework of the clearing banks. Certainly the industry would need some time to adjust to this significant change. But, once enacted, this regulatory action would lead to one of two outcomes:

A. The industry improves the technology of the tri-party system to reduce the amount of intra-day risk transfers. The resulting system could range from one with a relatively modest reduction in these transfers and greater dedicated capital to one with very little to no transfer of intra-day risk and little to no dedicated capital.
B. The operations of the funding market move from the clearing banks to another entity or entities, like a clearing house, which would not extend intra-day credit. This may be the outcome of the proposed policy because, without the provision of intra-day credit—or without the implicit risk subsidy of providing such credit—there is no obvious reason that operational services for the funding market should be provided by the existing clearing banks.

Either outcome A. or B. would substantially reduce the risk that failures of large borrowers in the secured funding market, i.e. broker-dealers, would weaken one of the large clearing banks. Either outcome would also correct the incentives of the secured lenders: in outcome A the clearing banks would most likely pass the capital requirements and risk charges through to secured lenders while in outcome B the clearing house would do the same.

But broker-dealers would very much prefer outcome B as a means to escape their vulnerability to the decisions and financial health of the two clearing banks. And this motivation is compounded by the fear that clearing banks will consider their other relationships with broker-dealers, e.g., as derivatives counterparties, when making decisions in the secured funding market.

In summary then, it is reasonable to conclude that imposing capital requirements and risk charges on intra-day risk will result in reduced systemic risk, through the withering away of the daily unwind, and in more rigorous competition and innovation in the provision of services to the secured funding market.

4.3 Industry proposals to date will not be as effective in stabilizing and strengthening the secured funding market.

At the invitation of the Fed, the clearing banks submitted proposals in the summer of 2009 to address the weaknesses of the tri-party repo system. Although these proposals are not public, some of the ideas have been made available to the industry and reported in the press.[11] These proposals do recognize the risks raised by the daily unwind, particularly for term trades, but the thrust of the proposals is essentially to set up a lender of last resort for tri-party repo. In particular, if, at the determination of the clearing banks and the regulators, a broker-dealer will not be able to fund itself, temporary financing would be made available from the central bank through the clearing bank. The hard-to-fund assets would then be moved to an emergency entity which would oversee an orderly liquidation. Finally, any losses accruing to the clearing banks would be covered by an FDIC-like entity, i.e., funded by premiums paid by the industry.

Following the arguments of this paper, by leaving current operations and the daily unwind in place, these proposals fail to address the source of the systemic risk. Instead of the risk today that the federal government has to rescue the clearing banks, these proposals would substitute the risk that the federal government has to rescue an FDIC-like entity. This is a far inferior outcome to moving the intra-day risk back to where it belongs, namely to the secured lenders who contracted to take on that risk. Furthermore, while it is relatively easy to justify an FDIC as a means to protect uninformed depositors and furnish them with an investment vehicle free from counterparty risk, it is much harder to make the same case to protect secured lenders. Finally, the establishment of an explicitly too-big-to-fail FDIC-like entity might, by lowering the perceived risks of the system, perversely increase the use of secured funding and the systemic risks currently associated with the market.

As an aside, the proposals of the clearing banks also highlight and try to address the problem of ensuring an orderly unwind. While beyond the scope of this paper, it is worth noting that this problem applies to derivatives as well as repo markets: any contracts or agreements protected by the safe harbor

clauses, i.e., that can be liquidated before and outside of bankruptcy proceedings, are subject to a "rush for the exits" after a triggering event. Therefore, it makes more sense to propose procedures to ensure an orderly unwind in the context of all of a failing entities' contracts protected by the safe harbor clauses rather than propose procedures exclusively for repo contracts.

Subsequent to the first version of this paper, the "Task force on Tri-Party Repo Infrastructure" published a progress report on the website of the Federal Reserve Bank of New York. This report echoes the risks of the daily unwind and calls for "operational improvements to substantially reduce the size of the daily unwind and therefore the size of the intraday secured exposures taken on by the clearing banks." The report also highlights the particularly egregious practice of unwinding term repo and recommends removing "non-maturing term trades from the clearing bank daily unwind process." While clearly consistent with many of the arguments of this paper, these thoughts and recommendations fall short of internalizing the risks of the daily unwind through capital requirements and risk charges. This has two implications. First, the *ad hoc* persuasion of the Fed, rather than explicit costs, will have to drive the extent of operational improvements. Second, by envisioning operational improvements solely in the context of the current system, the task force report does not discuss or seemingly allow for the possibility that the operational services of the secured funding market might be better placed away from the two clearing banks.

The task force report also includes "Concepts for Further Review" that are not to be currently regarded as "draft recommendations." Four of these five "concepts" very much resemble the proposals the clearing banks sent to the Fed last summer, which are discussed above. The fifth concept, however, reads as follows:

Consider encouraging the piloting and development of alternative "utility-like" mechanisms (e.g., through FICC or a similar entity) that could offer a higher level of safety for certain transaction segments now conducted via the current tri-party arrangements.

FICC, the Fixed Income Clearing Corporation, is a user-owned utility that clears and settles fixed income products, including repo. Hence, this fifth concept may be a very timid call for consideration of a system without intra-day credit that resides away from the clearing banks.

5. Summary and Conclusion

Broker-dealers borrow a significant fraction of their total liabilities in the form of secured funding through the tri-party repo system. While many market participants believe that secured lenders bear all of the default risk from funding trades, the tri-party repo system does not, in fact, work this way. To facilitate the settlement process, that is, for operational convenience, a process known as the "daily unwind" effectively transfers the intra-day default risk of funding from all the lenders to the two tri-party repo clearing banks. But since these clearing banks are themselves systemically important institutions, this transfer of intra-day risk significantly exacerbates systemic risk. Not surprisingly, then, the flaws of the tri-party repo system became visible in 2008: the clearing banks do seem to have been

significantly exposed to potential defaults by Bear Stearns and Lehman Brothers and this exposure does seem to have been important in precipitating certain actions by them and by the Fed.

This paper argues that bank capital requirements and risk charges should be changed to include the intra-day risk incurred through the daily unwind of the tri-party repo system. The industry will then be forced to correct the existing systemic risk on its own and, by leveling the playing field in the provision of services to the secured funding market, spur competition and innovation. Using the same line of reasoning, this paper also argues that two competing proposals are not as well conceived. One proposal, namely to create an FDIC-like entity to backstop the tri-party system, would needlessly perpetuate the systemic risk of current market practice by making the too-big-to-fail nature of the system explicit. Another proposal, for the Fed to monitor the industry in improving operations and reducing the magnitude of the daily unwind, is directionally appropriate but suffers from two weaknesses. First, without explicit and complete recognition of the intra-day risk currently in the system, the industry's reduction in that risk may very well not be sufficient. Second, mandating a particular reduction in the risk of the current system effectively enshrines the current system and the current role of the clearing banks.

The bankruptcies of Drysdale Government Securities, E.S.M. Government Securities, and others in the early 1980's resulted in large losses to investors because

"the failing firm[s] treated … repo collateral that it was holding in safekeeping for customers loosely to say the least" and because "the failing firm[s] gave inadequate collateral to customers when it repoed securities out to customers and/or it demanded excessive collateral when it reversed in securities from customers."[12]

The current tri-party repo system evolved into its current form to remedy these and other weaknesses of previous systems while facilitating secured lending to the extent possible. In a similar way, the events of the recent past have revealed weaknesses of the tri-party repo system that have to be remedied in the next evolution of secured funding markets.

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[1] Technically, a repo is a sale of a security with an agreement to repurchase that same security for a fixed price at some time in the future.

[2] See, for example, "Domestic Open Market Operations During 2008," Markets Group of the Federal Reserve Bank of New York, January, 2009, pp. 8-13.

[3] "Flow of Funds Accounts of the United States," Board of Governors of the Federal Reserve, September 17, 2009, table L129.

[4] Another important objective, not relevant enough for discussion in the text, is automated collateral allocation. Funders and lenders agree on a set of criteria governing collateral posted against loans and the clearing banks ensure that the collateral posted each day meet those criteria. For example, one funder might accept only U.S. Treasury collateral while another might accept government-sponsored entity collateral as well.

[5] It is unclear to what extent term repo lenders were aware of their operational ability to withdraw cash before the Lehman bankruptcy.

[6] The TSLF was announced on March 11, 2008, during the week leading up to the collapse of Bear Stearns. The program allows primary dealers to receive Treasury collateral from the Fed in exchange for less liquid collateral. The dealers could then post these Treasuries to another private counterparty as collateral against cash loans.

[7] The PDCF was announced on March 16, 2008, at the same time as the announcement of JPMorgan Chase's takeover of Bear Stearns. The PDCF allowed primary dealers to borrow, on a secured basis, directly from the Fed.
[8] Speech at the Federal Deposit Insurance Corporation's Forum on Mortgage Lending for Low and Moderate Income Households, Arlington, Virginia, by Chairman Ben S. Bernanke, July 8, 2008. Essentially the same remark was repeated in Speech at the Council of Foreign Relations, Washington, D.C., March 10, 2009.
[9] "The Federal Reserve's Primary Dealer Credit Facility," by Tobias Adrian, Christopher R. Burke, and James J. McAndrews, Federal Reserve Bank of New York Current Issues in Economics and Finance, Volume 15(4), August, 2009.
[10] "The Deal of the Century," by Tom Junod, Esquire, September 11, 2009.
[11] See, for example, "U.S. clearing banks submit repo reform proposals to Fed," by Elinor Comlay and Kristina Cooke, Reuters, July 10, 2009.
[12] The Money Market, Third Edition by Marcia Stigum, Richard D. Irwin, Inc., 1990, p. 468.